mHealth for Young Adults with Early Psychosis: User Preferences and Their Relationship to Attitudes About Treatment-Seeking

Benjamin Buck[1] · Ayesha Chander[1] · Justin Tauscher[1] · Theresa Nguyen[2] · Maria Monroe-DeVita[3] · Dror Ben-Zeev[1]

Abstract

A long duration of untreated psychosis reduces benefits of early intervention for early psychosis. Digital technologies have potential to encourage help-seeking and reduce barriers to care. Because of high rates of smartphone ownership, mobile health (mHealth) interventions may be particularly well-suited to increase access. There is a lack of available information on the specific features that may be most appealing to young adults with early psychosis. The present study remotely recruited 77 young adults with psychosis and surveyed their interest in mHealth features, delivery modalities, and attitudes toward treatment. Overall, respondents reported high utilization of digital health and high interest in psychosis-specific mHealth. They expressed the highest interest (ordered by mean score by item) in information about medications and side effects ($n = 69$, 89.6% reporting being "interested" or "very interested"), managing stress and improving mood ($n = 67$, 89.3%) and symptoms of psychosis ($n = 66$, 88%), as well as in tracking changes in symptoms ($n = 70$, 90.9%), and goals ($n = 66$, 86.9%). They also reported high interest in content being delivered as text ($n = 69$, 89.6%) and also in communicating directly with providers. Respondents were less interested in social features, and those with most negative attitudes toward help-seeking had particularly low interest in features related to disclosing symptoms to others. These results suggest mHealth may have potential to engage individuals with early psychosis, and that the most effective strategies may be those that are most straightforward, including direct psychoeducational information.

Keywords Mobile Health (mHealth) · Psychosis · Technology-based intervention · User-centered design

Introduction

Early psychosis (EP)—or the risk and clinical states preceding and following the first signs of psychotic illness—constitutes a critical period for prevention or early intervention to improve long-term outcomes of those at risk for schizophrenia-spectrum disorders (Fusar-Poli et al., 2017; Malla et al., 2005). Intensive specialty services (Dixon et al., 2015; Mueser & Cook, 2012; Windell et al., 2012),

provided in the early phase of illness, are associated with reduced symptom severity, hospitalizations, and dysfunction (Correll et al., 2018; Dixon et al., 2018; Kane et al., 2016). Despite their efficacy, few young adults with early psychosis access and maintain engagement with such programs (Patel et al., 2007). In addition to structural barriers like physical distance from clinics (Lal et al., 2020), costs and complexities in reimbursement systems (Powell et al., 2021), and challenges navigating the mental health system, young adults may hold self-stigmatizing attitudes toward psychosis and treatment-seeking (Lal & Malla, 2015). Individuals with early psychosis often feel shame about their symptoms, worry about others' reactions, and see benefits to concealing symptoms (Gronholm et al., 2017). A longer duration of untreated psychosis (DUP) is linked with poorer outcomes (Marshall et al., 2005) and reduced benefits from treatment (Kane et al., 2016). While the World Health Organization advises that DUP last no longer than 12 weeks (Azrin, 2017), the median DUP in

✉ Benjamin Buck
buckbe@uw.edu

1   Behavioral Research in Technology and Engineering (BRiTE) Center, Department of Psychiatry and Behavioral Sciences, University of Washington, WA, Seattle, USA

2   Mental Health America, VA, Alexandria, USA

3   Supporting Psychosis Innovation through Research, Implementation and Training (SPIRIT) Lab, Department of Psychiatry and Behavioral Sciences, University of Washington, WA, Seattle, USA
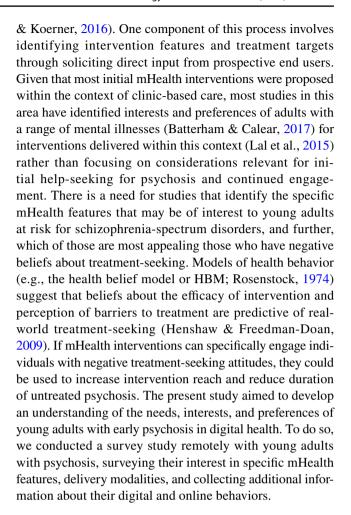
the USA has been estimated at 74 weeks (Addington et al., 2015).

Thanks to their accessibility and potential for maintaining user privacy, digital technologies may help reduce barriers to treatment resources—and potentially DUP—for young adults with early psychosis. Individuals with early psychosis commonly go online to access psychoeducation (Colder Carras et al., 2018; Lal et al., 2018), social support, and increasingly synchronous (i.e., involving immediate bidirectional communication, e.g., teletherapy) and asynchronous (i.e., involving time-lagged interaction, e.g., texting interventions) mental health interventions (Camacho et al., 2019; Firth & Torous, 2015). Mobile health (mHealth), a type of digital health using mobile devices, may have particular benefits for this population. The average young adult spends four times longer on smartphones than on Internet-connected computers (Nielsen, 2018), and both individuals with chronic schizophrenia-spectrum disorders (Firth et al., 2016; Gay et al., 2016) and young adults with early psychosis report high rates of smartphone ownership and interest in mobile health (Bonet et al., 2018; Camacho et al., 2019). A number of clinician-supported mHealth interventions have shown promise and feasibility in early psychosis, targeting self-management support (Terp et al., 2018), ongoing assessment and relapse prevention (Bonet et al., 2020), and increased social connection (Peck et al., 2020; Schlosser et al., 2016, 2018).

While most existing mobile health interventions for psychosis have been proposed as adjuncts to existing in-person service delivery (e.g., FOCUS, Ben-Zeev et al., 2018; Mindframe, Terp et al., 2018), fewer have focused on initial treatment seeking. Extant examples demonstrate that digital resources may be particularly effective in engaging individuals at risk before they have connected to care. For example, one program—Strong365—successfully used locally targeted Google and online screeners to reach individuals at risk for psychosis, but very few (i.e., around 1%) actually sought out services (Birnbaum et al., 2017). While these tools can access or identify at-risk individuals, there is a need for continued work to identify potent strategies to provide information, combat stigma, and foster treatment engagement. mHealth interventions are one candidate to address this gap. Given access in the general population to smartphones, such interventions could be low-cost, scalable, and rapidly available to young adults with early psychosis seeking support in the treatment-seeking period. Further, given their presence on devices that are carried with the individual, they have the potential to provide ongoing practice and psychoeducation.

Iterative user-centered design methods have been proposed as a means for improving the development, delivery, and potency of psychosocial and digital interventions (Lyon & Koerner, 2016). One component of this process involves identifying intervention features and treatment targets through soliciting direct input from prospective end users. Given that most initial mHealth interventions were proposed within the context of clinic-based care, most studies in this area have identified interests and preferences of adults with a range of mental illnesses (Batterham & Calear, 2017) for interventions delivered within this context (Lal et al., 2015) rather than focusing on considerations relevant for initial help-seeking for psychosis and continued engagement. There is a need for studies that identify the specific mHealth features that may be of interest to young adults at risk for schizophrenia-spectrum disorders, and further, which of those are most appealing those who have negative beliefs about treatment-seeking. Models of health behavior (e.g., the health belief model or HBM; Rosenstock, 1974) suggest that beliefs about the efficacy of intervention and perception of barriers to treatment are predictive of real-world treatment-seeking (Henshaw & Freedman-Doan, 2009). If mHealth interventions can specifically engage individuals with negative treatment-seeking attitudes, they could be used to increase intervention reach and reduce duration of untreated psychosis. The present study aimed to develop an understanding of the needs, interests, and preferences of young adults with early psychosis in digital health. To do so, we conducted a survey study remotely with young adults with psychosis, surveying their interest in specific mHealth features, delivery modalities, and collecting additional information about their digital and online behaviors.

Methods

Participants

A total of 77 young adults with psychosis completed data collection. Full sample demographics are reported in Table 1. Participants met inclusion criteria if they were (1) 18–30 years of age, (2) an English speaker, and (3) self-reported history of (or current) psychotic symptoms OR a diagnosis of a psychotic disorder. Participants were excluded if they did not live in the USA or had already participated in the study.

Procedure

The study was approved by the Institutional Review Board of the University of Washington. Online recruitment was conducted with Google Ads, Mental Health America (MHA) website, and emails to coordinated specialty care for psychosis managers/leads publicly available on the SAMHSA national directory (SAMHSA, 2020). Google Ads presents postings to users based on

Table 1 Demographic characteristics of the sample

		M (SD) or N (%)
Age		**23.68 (3.76)**
Gender*		
Male		**17 (22.1%)**
Female		**46 (59.7%)**
Non-binary		**14 (18.2%)**
Transgender		**8 (10.4%)**
Race/ethnicity*		
White/Caucasian		**52 (67.5%)**
Multiracial		**7 (9.1%)**
Black and White	**2 (2.6%)**	
Black and South Asian	**1 (1.3%)**	
East Asian and South Asian	**1 (1.3%)**	
Latinx and White	**1 (1.3%)**	
Native American and White	**1 (1.3%)**	
South Asian and White	**1 (1.3%)**	
Black/African-American		**6 (7.8%)**
East-Asian/Asian-American		**6 (7.8%)**
Latinx		**4 (5.2%)**
South-Asian/Indian-American		**1 (1.3%)**
Pacific Islander		**1 (1.3%)**
Native American		**1 (1.3%)**
PQ-B distress score (sum)		**50.51 (22.75)**
EASI-TS (mean)		**2.39 (0.88)**

*Categories are non-exclusive; participants could check more than one category

the extent to which their search terms match pre-selected clinical (e.g., schizophrenia, bipolar), non-clinical (e.g., talking to ghosts, am I crazy), and related (i.e., generated by the Google Ads "broad match" algorithm) keywords. Individuals who clicked on ads were directed to the study website. MHA made a link to the study visible to individuals who had just completed a mental health screener on their website. In addition, the research team sent emails to psychosis specialty program leads/managers which included a brief summary of the study and a link to access the study website.

The study website provided information explaining the project with a link to download the consent form. If participants were interested, they were advised to click on a "see if I am eligible" button, which directed them to a REDCap survey. Participants were initially asked to provide informed consent (by answering comprehension questions about details of the study) and answer eligibility questions. If they were found eligible to participate, the research team would reach out to them within 3 business days with a link to the study survey. Participants were compensated with a $15 Amazon Gift Card for completing the study surveys.

Measures

Participants completed a series of questions related to their current and potential use of technologies to support their mental health. After providing demographic information, they were asked whether they owned a mobile phone and if so, how they used it, including questions about the typical number of phone calls they place and text messages that they send. Then, participants identified preferences for potential features of an mHealth app (26 items), the modality by which the app should deliver content (four items), individuals they would like to communicate with using the app (six items), and how they would any communication to occur (seven items). All items were rated on a five-item Likert scale, ranging from 0 (not at all interested) to 4 (very interested). This scale was developed by two authors with experience in digital health research (B.B. & D.B.Z.) and was intended to represent a sampling of mobile health features that are common to existing or prospective interventions. Previous versions of this measure focused on caregivers' interest in mobile health have been reported on elsewhere (Buck et al., 2021). Items are listed in Tables 2 and 3.

Participants also completed assessments of psychotic symptom risk and treatment-seeking beliefs. Risk for psychosis was assessed with the Prodromal Questionnaire, Brief Version (PQ-B; Loewy et al., 2011), a 21-item questionnaire that assesses a range of positive symptoms with follow-up questions about related distress/impairment. Treatment-seeking beliefs about mental health were assessed with the Endorsed and Anticipated Stigma Inventory, Treatment Seeking subscale (EASI; Vogt et al., 2014a, b). This 8-item subscale of the full Endorsed Anticipated Stigma Inventory is focused on beliefs related to seeking mental health services; previous work has demonstrated that it is more closely related with actual treatment-seeking than those of anticipated stigma overall (Vogt et al., 2014a, b). In the current sample, both the PQ-B (Cronbach's $\alpha = 0.90$) and EASI-TS subscale (Cronbach's $\alpha = 0.88$) demonstrated good internal consistency.

Data Analytic Plan

We conducted descriptive analyses to examine participants' responses to measures of current technology ownership and use, as well as responses to items examining interest in specific mHealth features, delivery modality, and communication features. Specifically, among mobile app feature items, we report the number of participants who reported scores of being "interested" or "very interested" in the feature described in each item (as opposed to "somewhat interested," "a little interested" or "not interested at all"). Last, to examine the impact of treatment-seeking beliefs on interest in specific mHealth features, we conducted

Table 2 Overview of responses to items related to interest in specific app features

	Not at all interested 0	A little interested 1	Somewhat interested 2	Interested 3	Very interested 4	M (SD)
Information about medications and their side effects	1 (1.3%)	3 (3.9%)	4 (5.2%)	17 (22.1%)	52 (67.5%)	**3.51 (0.87)**
Information about managing your stress and improving your mood	2 (2.7%)	2 (2.7%)	4 (5.3%)	19 (25.3%)	48 (64.0%)	**3.45 (0.92)**
Information about the symptoms of psychosis	1 (1.3%)	1 (1.3%)	7 (9.3%)	21 (28.0%)	45 (60.0%)	**3.44 (0.83)**
Tracking changes in your symptoms over time	2 (2.6%)	2 (2.6%)	3 (3.9%)	23 (29.9%)	47 (61.0%)	**3.44 (0.90)**
Tracking changes in progress toward your goals	1 (1.3%)	2 (2.6%)	7 (9.2%)	24 (31.6%)	42 (55.3%)	**3.37 (0.86)**
Information about psychological treatments	1 (1.3%)	3 (3.9%)	7 (9.1%)	23 (29.9%)	43 (55.8%)	**3.35 (0.90)**
Communicating with experts in psychosis	2 (2.6%)	1 (1.3%)	11 (14.5%)	20 (26.3%)	42 (55.3%)	**3.30 (0.95)**
Skill practices for managing your stress and improving your mood	2 (2.6%)	3 (3.9%)	7 (9.2%)	22 (28.9%)	42 (55.3%)	**3.30 (0.98)**
Information about the mental health system	2 (2.6%)	5 (6.6%)	4 (5.3%)	26 (34.2%)	39 (51.3%)	**3.25 (1.01)**
Setting and tracking goals	3 (3.9%)	3 (3.9%)	11 (14.3%)	26 (33.8%)	34 (44.2%)	**3.10 (1.05)**
Skill practices for relaxation	3 (4.0%)	5 (6.7%)	10 (13.3%)	21 (28.0%)	36 (48.0%)	**3.09 (1.12)**
Appointment reminders	5 (6.5%)	4 (5.2%)	12 (15.6%)	17 (22.1%)	39 (50.6%)	**3.05 (1.21)**
Information about relaxation exercises	5 (6.6%)	4 (5.3%)	8 (10.5%)	28 (36.8%)	31 (40.8%)	**3.00 (1.16)**
Help communicating with your family about psychosis	5 (6.5%)	7 (9.1%)	10 (13.0%)	21 (27.3%)	34 (44.2%)	**2.94 (1.24)**
Information about healthy sleep practices	4 (5.3%)	6 (7.9%)	10 (13.2%)	27 (35.5%)	29 (38.2%)	**2.93 (1.15)**
Skill practices for communicating with your family	4 (5.2%)	6 (7.8%)	10 (13.0%)	31 (40.3%)	26 (33.8%)	**2.90 (1.12)**
Communicating with other people affected by psychosis in recovery	4 (5.3%)	7 (9.2%)	11 (14.5%)	26 (34.2%)	28 (36.8%)	**2.88 (1.17)**
Tracking your wellness behaviors (for example, your steps or activity)	4 (5.4%)	7 (9.5%)	15 (20.3%)	17 (23.0%)	31 (41.9%)	**2.86 (1.22)**
Information about communicating with others about psychosis	4 (5.2%)	9 (11.7%)	12 (15.6%)	21 (27.3%)	31 (40.3%)	**2.86 (1.22)**
Skill practices for communicating with others about psychosis	5 (6.5%)	5 (6.5%)	14 (18.2%)	30 (39.0%)	23 (29.9%)	**2.79 (1.14)**
Information about community events (i.e. support groups)	6 (7.8%)	11 (14.3%)	9 (11.7%)	23 (29.9%)	28 (36.4%)	**2.73 (1.30)**
Mindfulness or meditation practices	6 (8.1%)	13 (17.6%)	11 (14.9%)	18 (24.3%)	26 (35.1%)	**2.61 (1.34)**
The ability to view video/photo posts of others' sharing their experiences with psychosis	9 (11.8%)	14 (18.4%)	11 (14.5%)	24 (31.6%)	18 (23.7%)	**2.37 (1.35)**
Facilitated conversation with your provider and a family member (via video or phone call)	12 (15.8%)	11 (14.5%)	17 (22.4%)	16 (21.1%)	20 (26.3%)	**2.28 (1.41)**
Facilitated conversation with your provider and a family member (via text)	15 (19.7%)	11 (14.5%)	14 (18.4%)	15 (19.7%)	21 (27.6%)	**2.21 (1.49)**
The ability to share your experiences with other people who have experienced psychosis through video/photo posts	17 (22.4%)	12 (15.8%)	14 (18.4%)	16 (21.1%)	17 (22.4%)	**2.05 (1.48)**
The ability to share your experiences with friends/family through video/photo posts	23 (30.3%)	12 (15.8%)	15 (19.7%)	13 (17.1%)	13 (17.1%)	**1.75 (1.48)**

Table 3 Overview of responses related to informational content and direct communication

Characteristics of app informational content	Not at all interested	A little interested	Somewhat interested	Interested	Very interested	
	0	**1**	**2**	**3**	**4**	**M (SD)**
Modality						
Written text	1 (1.3%)	2 (2.6%)	5 (6.5%)	23 (29.9%)	46 (59.7%)	**3.44 (0.84)**
Discussion board	6 (7.8%)	11 (14.3%)	16 (20.8%)	20 (26.0%)	24 (31.2%)	**2.58 (1.28)**
Video	10 (13.0%)	10 (13.0%)	14 (18/2%)	19 (24.7%)	24 (31.2%)	**2.48 (1.39)**
Audio	8 (10.4%)	12 (15.6%)	16 (20.8%)	20 (26.0%)	21 (27.3%)	**2.44 (1.32)**
Direct messaging						
Respondent						
Psychiatrists (MD)	2 (2.7%)	1 (1.3%)	5 (6.7%)	20 (26.7%)	47 (62.7%)	**3.45 (0.89)**
Individual Therapists (psychologists or social workers)	2 (2.7%)	2 (2.7%)	4 (5.3%)	21 (28.0%)	46 (61.3%)	**3.43 (0.92)**
Researchers or experts	1 (1.3%)	5 (6.7%)	7 (9.3%)	19 (25.3%)	43 (57.3%)	**3.31 (0.99)**
Family therapists (psychologists or social workers)	5 (6.6%)	7 (9.2%)	11 (14.5%)	19 (25.0%)	34 (44.7%)	**2.92 (1.25)**
Others with psychosis in recovery	5 (6.6%)	9 (11.8%)	11 (14.5%)	22 (28.9%)	29 (38.2%)	**2.80 (1.26)**
People from your support network (friends, family members)	7 (9.1%)	13 (16.9%)	11 (14.3%)	23 (29.9%)	23 (29.9%)	**2.55 (1.32)**
Modality						
Two-way (send and receive) text messages	1 (1.3%)	4 (5.3%)	7 (9.3%)	29 (38.7%)	34 (45.3%)	**3.21 (0.92)**
Discussion board	6 (7.8%)	7 (9.1%)	18 (23.4%)	20 (26.0%)	26 (33.8%)	**2.69 (1.25)**
Public posts (written, video, or photos)	7 (9.3%)	10 (13.3%)	15 (20.0%)	25 (33.3%)	18 (24.0%)	**2.49 (1.26)**
Picture messages	12 (16.0%)	14 (18.7%)	15 (20.0%)	22 (29.3%)	12 (16.0%)	**2.11 (1.33)**
Video messages	17 (22.7%)	17 (22.7%)	15 (20.0%)	18 (24.0%)	8 (10.7%)	**1.77 (1.33)**
Phone calls	17 (22.1%)	21 (27.3%)	18 (23.4%)	13 (16.9%)	8 (10.4%)	**1.66 (1.28)**
One-way (receive only) text messages	20 (26.3%)	16 (21.1%)	25 (32.9%)	8 (10.5%)	7 (9.2%)	**1.55 (1.25)**
Video calls	23 (29.9%)	19 (24.7%)	13 (16.9%)	15 (19.5%)	7 (9.1%)	**1.53 (1.34)**

two exploratory analyses. First, we examined correlations between individual mHealth feature items and the EASI treatment-seeking beliefs scale to identify relationship between feature preferences and help-seeking attitudes. In order to identify features most preferred by those with negative treatment-seeking attitudes, we then divided the group at the median value of the EASI-TS subscale in this sample and reported the items that were most popular among individuals who scored in the top half of negative treatment-seeking attitudes.

Results

Current Use of Technology

Current Smartphone Use

Nearly all respondents reported owning a smartphone ($n = 75$, 97.4%). Of those who owned cell phones, all reported that they used that phone every day ($n = 76$, 98.7%). Most reported using their cellphone for texting ($n = 73$, 94.8%), browsing the Internet ($n = 73$, 94.8%), social media ($n = 70$, 90.9%), emails ($n = 70$, 90.9%), and slightly fewer reported using their phone for phone calls ($n = 63$, 81.8%). The most commonly reported social media platforms that participants reported using were Facebook ($n = 66$, 85.7%), Instagram ($n = 57$, 74.0%), and Snapchat ($n = 51$, 66.2%). Almost three quarters of participants reported that they log in to a social media platform every day ($n = 56$, 72.7%), and nearly two-thirds ($n = 54$, 70.1%) of the sample reported that they are logged on to social media for two or more hours per day. To better characterize typical smartphone use, participants were asked to report on the day they responded to the survey. While most ($n = 66$, 85.7%) had reported that they had sent a text message, a lower number—but still a majority—reported that they had placed a phone call ($n = 41$, 53.2%). Over half ($n = 39$, 50.6%) reported that they had sent six or more text messages.

Current Digital Health Use

A large majority of participants reported that they had used technology previously to better understand or cope with their condition ($n=73$, 94.8%) or gone online for health information ($n=75$, 97.4%). A majority also reported that they had previously looked for others with similar health concerns online ($n=65$, 84.4%), read or watched someone else's health-related story online ($n=63$, 81.8%), used apps related to health ($n=54$, 70.1%), and connected to health providers online ($n=41$, 53.2%).

Overall mHealth Interests and Preferences

App Features and Delivery Modality

As reported in Table 2, the top five app features respondents reported interest in—ordered by mean score on the interest measure—were information about medications and side effects ($n=69$, 89.6% responding "interested" or "very interested"), information about managing stress and improving mood ($n=67$, 89.3%), tracking changes in symptoms over time ($n=70$, 90.9%), information about symptoms of psychosis ($n=66$, 88%), and tracking changes in progress toward goals ($n=66$, 86.9%). The five least appealing features were having the ability to share experiences with friends/family through video/photo posts ($n=26$, 34.2%), the ability to share experiences with other people who have experienced psychosis through video/photo posts ($n=33$, 43.5%), facilitated conversation with their provider and a family member via text ($n=36$, 47.3%), facilitated conversation with their provider and a family member via video or phone calls ($n=36$, 47.4%), and the ability to view video/photo posts of others' sharing their experiences with psychosis ($n=42$, 55.3%). Participants were also asked about the preferred modality through which they would like to receive intervention content. Most reported interest in content being delivered in written text ($n=69$, 89.6%), followed by discussion boards ($n=44$, 57.2%), video ($n=43$, 55.9%), and audio ($n=41$, 53.3%).

Direct Communication

Participants were surveyed on the possibility of in-app direct messaging. They reported a high interest in a range of individuals with whom they could communicate, most notably psychiatrists ($n=67$, 89.4%), individual therapists ($n=67$, 89.3%), and researchers ($n=62$, 82.6%). In general, participants were more likely to report interest in communicating with these individuals using two-way texting ($n=63$, 84%), as opposed to one-way texts ($n=15$, 19.7%), audio call ($n=21$, 27.3%), video call ($n=22$, 28.6%), or video messages ($n=26$, 34.7%).

mHealth Interest Among Individuals with Negative Treatment-Seeking Attitudes

As expected, all significant relationships between mHealth feature and stigmatizing attitudes toward treatment-seeking were negative, indicating that the more negative treatment-seeking attitudes held by a respondent, the less likely they were to express interest in a particular feature. The mHealth features that were most sensitive to this effect—as indicated by a significant correlation between negative treatment-seeking attitudes and feature interest—were as follows: help communicating with your family about psychosis ($r=-0.34$, $p=0.003$), facilitated conversation with your provider and a family member ($r=-0.30$, $p=0.01$) skill practices for communicating with others about psychosis ($r=-0.29$, $p=0.01$), skill practices for communicating with your family ($r=-0.25$, $p=0.03$), setting and tracking goals ($r=-0.29$, $p=0.01$), and information about the mental health system ($r=-0.23$, $p=0.048$). With regard to delivery modality, content delivered via video ($r=-0.24$, $p=0.03$), and interactions with a family therapist ($r=-0.24$, $p=0.04$), and via discussion boards ($r=-0.28$, $p=0.01$) and public posts ($r=-0.28$, $p=0.01$) were most closely associated with negative treatment-seeking attitudes.

To examine the items that were least sensitive to negative attitudes about treatment-seeking, we examined feature preference scores among individuals who scored above the median in negative treatment-seeking attitudes on the EASI. In general, individuals with more negative treatment-seeking attitudes expressed the highest interest in features that were focused on psychoeducation information, and the lowest interest in features that involved public disclosure with family members or other users of the platform. Among these individuals, the most popular features included information about managing stress and improving mood ($n=36$, 87.8%), information about the symptoms of psychosis ($n=35$, 85.4%), information about medications and their side effects ($n=36$, 85.7%), tracking changes in progress toward your goals ($n=36$, 85.7%), and tracking changes in symptoms over time ($n=37$, 88.1%). The lowest-interest items included the ability to share your experiences with friends/family through video/photo posts ($n=13$, 31.0%), the ability to share your experiences with other people who have experienced psychosis through photo/video posts ($n=16$, 38.0%), facilitated conversation with your provider and a family member through video or phone ($n=15$, 36.6%), facilitated conversation with your provider and a family member through text ($n=18$, 43.9%), and the ability to view video/photo posts of others' sharing their experiences with psychosis ($n=22$, 52.4%).

Discussion

As a population that now consists almost entirely of digital natives, young adults with early psychosis appear inclined to use digital health tools to support their health. These results elaborate on the specific needs and interests of young adults with regard to their use of mHealth to support their mental health. Overall, respondents reported high utilization of digital health technologies and high interest in psychosis-specific mHealth features. Interestingly, while participants reported frequent usage of social platforms with photo and video sharing, for a psychosis-specific tool, they expressed the highest interest in straightforward informational content, asynchronous media, written text, and two-way text messages. These trends were more pronounced among individuals with more negative beliefs about treatment-seeking, as individuals reporting these beliefs were significantly less interested in features that involve others (e.g., family members or other users with psychosis) in their recovery or services.

A number of more specific trends emerged in these results. First, participants reported high use of digital technologies and moderately high engagement in digital health. The majority of the sample reported searching the internet for health information, using health-related mobile apps, connecting to others with similar health conditions online as well as reading or watching others' narratives related to health. These results echo and additional granularity to previous work suggesting young adults with mental health conditions are open to using online tools to support their health (Burns et al., 2010; Gowen et al., 2012). One notable finding regarding participants' engagement with technology pertained to their use of texting. Respondents were much more likely to report using their smartphone to text (95%) rather than to place phone calls (82%). This finding matches popular media (Alton, 2017) and empirical observations (Harari et al., 2019) suggesting that young adults may communicate more frequently through text messages than phone calls. Telepsychiatry via videoconferencing—which is one valuable tool to engage those in need of services in the era of COVID-19 (Shore et al., 2020)—may be less acceptable to this population remotely given these attitudes; interventions provided via text messages could increase engagement (Kopelovich et al., 2020).

Second, participants reported on their attitudes toward a number of specific intervention features, communication functions, and preferred delivery modality. The aforementioned preference for texting was echoed in participants' reported preferences for written text. Participants reported that they most preferred written text to audio, video, or discussion board intervention delivery. They also described interest in communicating with a number of relevant supports (e.g., psychiatrists, individual therapists, experts) and reported a clear preference for communicating through two-way text messages, above and beyond phone calls, discussion board posts, or one-way messages.

Third, trends emerged in respondents' reported interest in mHealth features. Three of the four features in which participants reported the highest level of interest (e.g., information about managing stress and improving mood, information about medications and side effects, information about symptoms of psychosis) all involved the delivery of accurate information about psychosis or mental health. This mirrored previous findings (Lal et al., 2015). Participants expressed the lowest levels of interest in social or interactive features (e.g., sharing experiences with peers, viewing peers' stories, interacting with family members). Because members of this population are very active on social media, intervention developers may assume that young adults with early psychosis have a specific interest in social or interactive features in digital health. However, our results suggest this may not be the case.

Last, individuals with more negative beliefs about treatment-seeking reported particularly low preferences among features that involved others, including those involving support in communicating with family members about psychosis or connecting with other young adults with lived experience. These findings resemble trends in literature examining help-seeking, as many report that concerns about privacy are often a key barrier preventing their presentation to clinical services. On the other hand, proposed mHealth features that involved psychoeducation—related to interventions, medications, and coping strategies—were still appealing to those with negative attitudes toward help-seeking. This suggests mobile health could be useful as an initial engagement point for individuals with negative treatment-seeking attitudes and that any tools developed for this purpose should emphasize psychoeducation and coping strategies. If individuals are able to access high-quality information about psychosis and interventions via a mobile app, repeated engagement could challenge the negative attitudes toward treatment-seeking that too often lengthens duration of untreated psychosis. mHealth could either ensure users access important content when they're unwilling to present to treatment or—by challenging stigmatizing attitudes—could help them overcome this barrier.

This study has several limitations. The first pertains to representativeness broadly. These data are intended to guide development of interventions for digitally active members of this population. Thus, all participants engaging in the survey

engaged via digital means (i.e., Google ads, online links). This sample may represent the most digitally active young adults with early psychosis and should not be interpreted as providing estimates of interest in the full population of individuals with early psychosis (i.e., the full continuum of digital involvement in this population). This is also the case as it pertains to generalizability to multiple racial/ethnic groups; some groups (e.g., Latinx, Black, or African-American) were underrepresented in this sample. One strength of the sample was its representation of gender diversity, as nearly a fifth of the sample identifying as non-binary, and one in ten identifying as transgender. While our study provides a starting point to understand overall trends for young adults with EP, development and dissemination work should also incorporate insights from studies focused in-depth on the experiences of underrepresented groups, particularly considering racial-ethnic service disparities in both specialty and community care for psychosis (Oluwoye et al., 2018). Our results are also limited by the lack of a non-EP comparison group; thus, they cannot speak to whether the preferences identified here for individuals with early psychosis differ from those of young adults with other mental health symptoms or in the non-clinical population. Second, the use of a rating scale for preference elicitation does not allow for measurement of relative importance of features when compared against each other in different combinations. Results from this study could inform other methodologies—e.g., discrete choice experiments (Mühlbacher & Johnson, 2016)—that identify the most preferred combinations of features to further narrow to ideal functions. Finally, survey options were non-exhaustive and connected to common examples of available or feasible mHealth interventions. While this method allows comparison of prospective features, it limits the range of possibilities about which respondents express preferences. Future work involving more in-depth interview procedures would complement the present study nicely, and future developments in mobile technologies could impact the range of options to consider in this kind of work.

In addition to being deployed in the context of ongoing clinical care, mobile health tools have the capacity to be deployed remotely and directly to users. Our results suggest that young adults with early psychosis may have high interest in mobile health and may be particularly interested in straightforward informational features delivered through traditional means (i.e., written text). These tools could have a significant impact given the considerable informational and attitudinal barriers this population faces to treatment seeking. With a clearer understanding of the mobile health features that are appealing to young adults with early psychosis and negative treatment-seeking beliefs, intervention developers can develop tools that appeal to this unique clinical population and could encourage them to seek or maintain engagement in services.

Data, Materials, and Code Availability Data and materials are available to qualified investigators upon request to the research team.

Declarations

Dr. Ben-Zeev has an intervention content licensing agreement with Pear Therapeutics and has a financial interest in FOCUS technology. He has consulted for Trusst Health Inc., eQuility, and Otsuka Pharmaceuticals Ltd. The other authors have no conflicts to disclose. This project was reviewed by and approved by the Internal Review Board at the University of Washington (STUDY00006373).

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